NEWSLETTER

DIGNAN PHOTOGRAPHIC INC., 12304 ERWIN ST., NO. HOLLYWOOD, CALIF. 91606

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MAY 1970

THE METALCHROME STORY
By Grey L. Silva

SIMPLIFIED C-22 FORMULAS

OFFICIAL KODAK INTERNEGATIVE FORMULAS

No, we are not crazy, offering our color paper on a money back guarantee. We did it for three reasons: 1) We had faith in people and it was justified, 2) We believe the paper is great and our customers have confirmed that fact, 3) it is difficult to introduce a new color paper and we felt it would take something dramatically different to make our customers aware of it.

However, black and white is still the king of the darkroom. Printing color is like a first date - you are dying to meet, but you are scared to death.

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First came the postal strike, and orders piled up. It was a month before the Los Angeles Post Office would accept packages destined for New York. We were kept busy trying to explain to the calls that flooded in wanting to know why the delay. Then came the trucking strike. It is rumored that it is over, but attempting to secure any number of items is still a problem, at least in Southern California. The paper this Newsletter is printed on was on order for three months and only arrived a few days ago. Hopefully, things will return to some sort of normalcy, provided we are not invaded from outer space.

WHY USE 5251 OR 5254?

A good friend called and asked this question the other day. We answered - the grain is finer than CPS. We thought everyone knew that. Our friend then made a good point. You got to tell them and tell them and tell them.

C-22 AGAIN?

We think you will find the Simplified C-22 in this issue easier to mix and use. Notice also that the total processing time is shorter than the Official kit.

OPEN LETTER TO KODAK

Recently we performed a rather strange experiment. Curiosity made us take a quart sized can of Kodak's D-76 developer and we noted that the net content of the can contained exactly 3½ ounces of chemical. This meant that the 3½ ounces of chemicals, when dissolved, would make one quart of working solution of D-76.

Next, we looked at the Official formula for D-76, and added up the total chemical (avoirdupois) content. This proved to be 3 ounces, plus 276 grains. If one ounce equal 437.5 grains (and it does), this meant that the Official D-76 formula contained exactly 1,588.5 grains. Using the same idea we reduced the content of the Kodak can to its grain equivalent. This proved to be exactly 1,531.5 grains --- or a difference of 57 grains less in the quart can as opposed to the Official one quart formula!

If you're not geared to grains, then we hasten to add the fact that 57 grains is the approximate equivalent of 3.69 grams! Kodak maintains they have a chemical in their single mix developers which permit them to be mixed all at once. If this is true, then the content of the can should even weigh more than the official formula.

We can't help but wonder what's in the Kodak can of D-76! Obviously it isn't D-76 as we know it from the official formula. And if it isn't D-76, as we know it, then why does Kodak persist in calling it D-76? Perhaps it's just another example of Kodak Kreated Konfusion.

To further illustrate our point about Kodak Kreated Konfusion, we also add the following piece of puzzlement. In Kodak's Direct Reversal Black and White Kit, they have a bleach. The bleach comes in a can of powder, and when mixed makes up the required dichromate bleach. However, in the Official Kodak formula for their direct reversal film process they list the bleach as containing concentrated sulphuric acid! If Kodak has figured out a safe substitute for the dangerous sulphuric acid, then why don't they make this valuable information available to the photographer who mixes his own? Readers of the Newsletter know how this is done, but the average photographer has to take his chances with deadly acid. We can't help but wonder about these two points, and probably dozens of other such inconsistancies. It's no wonder that today's photographer is confused and frustrated by the lack of information he needs.

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the metalchrome story

By Grey L. Silva

The name "Metalchrome" implies the conversion of the silver image in a photograph to metallic salts—plus the addition of color.

In essence, toners and water soluble analine dyes are used selectively and in combination to color the image within the emulsion of the print. The colors are transparent—there is no overlay of opaque pigment on the surface, as with photo-oils.

In practice, a black-and-white print is sepia-toned. Gold chloride solution is then applied selectively to the flesh-tone and other warm-tone areas to produce red tones. The chemical tones thus produced are then modified with the dyes to produce the very real and beautiful flesh tones characteristic of this process. Dyes are then used over the rest of the print to suit the mood and key of the picture according to the wishes of the maker.

THE CAPSULIZED description above, in essentially the same form, was written as a foreword to the color section of a reprint of *Monsters and Madonnas,* a collection of pictures made by the late William Mortensen, FPSA. It is the only information on the Metalchrome process published up to this time.

This toner and dye process of turning a black-and-white print into a color print was developed by Mr. Mortensen and was refined over many years. From the twenties to the late thirties he experimented with all manner of toners, pigments and dyes, trying to find a combination which would produce a valid result under complete control of the maker. Prior to his death in 1965, the process was known only by those of his students who had contracted to take this particular instruction. Understandably, since teaching was an important part of Mortensen's professional career, each student was asked to agree not to divulge details of the instruction.

Since his passing his widow, Mrs. Myrdith Mortensen, has come to believe with the author that the process in detail should be on permanent record for at least two reasons: to put the information in the hands of the print-makers who might best appreciate and use it, and to commemorate the life and work of William Mortensen, one of the "great ones" of this century. We of the Photographic Society of America are deeply grateful to Mrs. Mortensen for her permission and cooperation in preparing this article for the membership.

William Mortensen was born in Park City, Utah, high in the Sawtooth Range which overlooks Salt Lake City, in 1897. He was much interested in art through his school years—studying at that time under J. T. Harwood of Salt Lake City. At the end of World War I, ex-private Mortensen signed up with Art Students' League in New York. There he studied under such teachers as George Bridgman, George Bellows, and Robert Henri. He then went to Greece to paint, etch, and as he put it "to starve rather ungracefully." Leaving Greece broke and somewhat disillusioned, he returned to Salt Lake City to teach art in his old high school.

This he did until the lure of Hollywood attracted him in the early twenties. He worked with Ferdinand Pinney Earle as set designer for "The Rubaiyyat of Omar Khayyam," and learned photography under Arthur Kales, a prominent still photographer of that time. Kales was much impressed with young Mortensen, who progressed so rapidly it wasn't too long before he was head still man for Cecil B. DeMille in such pictures as "King Kong" and "King of Kings." In the latter picture he abandoned the usual procedure of taking posed movie stills with an 8 x 10 camera. By using a much smaller camera and shooting during the actual filming of the scenes he achieved amazing results. A portfolio of his pictures from "King of Kings" is in the Vatican Library.

He eventually settled in Laguna Beach, Calif., an art colony of that day, for a life somewhat less hectic than that of Hollywood. There, in the early thirties, he found the time and the curiosity to delve into control processes. The reason behind this preoccupation was his deep conviction, born of his art training, that there should be a means of controlling unwanted detail in any picture. This opinion, of course, is shared by some and rejected by others in photographic circles. He worked on various means of controlling or eliminating detail on the negative and on the print. After years of experimenting in this di-

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ORIGINAL METALCHROME TEXT
MORTENSEN SCHOOL OF PHOTOGRAPHY
Laguna Beach, California

Instructions for Metalchrome Process

The information contained in this book, and in the course of which it is a part, is accepted by the student on the pledge that he will keep it solely for his own reference, and under no condition loan, sell, or reveal any details of the process to any person or persons whomsoever.

Outline of Metalchrome Process

Subject Matter to Select:
Simple broad masses with one primary or dominant color, this place coincident to the greatest subject interest.

Subject Matter to avoid:
1. Intricate patterns involving numerous small areas of various colors.
2. Contrast of lighting.
3. Contrast of local tones.

Lighting:
Basic or modified basic or plastic.

Printing Paper:
Gavaert Projection Proof 2N.

Exposure, Print:
For light-area.

Develop:
Fully; for at least 4 minutes in Pictone 4 to 1.

Fix:
In usual manner in normal acid hypo.

Wash:
Thoroughly to remove every trace of hypo. If prints are dry, soak before beginning color. Wipe as dry as possible on both sides with towel.

Immerse Print in Ferricyanide Bleach:
When bleaching is completed (bleached areas turn lemon yellow), wash thoroughly. Then place in Sulphide solution for one minute.

Wash Thoroughly:

Blue and Gray Eyes:
Apply a wad of chewing gum to this area before the Ferricyanide Bleach.

For Red, Orange, Warm Brown, and Flesh Tones, Continue As Follows:

Apply Gold Chloride Toner With Brush.
Apply first to lips and other portions where deep red tones are desired. When distinct redness appears in lips, apply toner to cheeks and spread it from there over the rest of face. When toning has progressed far enough, **blot** off excess toner. Wash thoroughly.

Your Chemical Red Tones Are Now Complete.

Secondary Color Agents:
You are now ready for the application of the secondary color agents.

1. The background at this time, is a tan color. Over this background a "flow" of either dilute three-color blue or yellow is applied. This establishes a "key" of color harmony to which the flesh or other portions of the main image must conform.
2. Remember that every color must possess some of the tint of the color bordering it. This is imperative if harmony is to be obtained.
3. The flesh of a portrait must have a wash of dilute three-color blue over all the area except the lips.
4. Other portions of the print are then colored with application of the color desired, or any combination of the three primary dyes. Experience will show that any color in the pigment world can be obtained by the admixture of the three primaries.
5. After the main areas of the color have been applied (usually with the large brush) the remaining application of the dye is done with a small No. 4 sable brush and with great care and patience small areas of too hot color are cooled down while small areas of too cold color are toned into warmer shade.

Notes On Treatment of Flesh Tones.
1. When gold chloride toning is complete, flesh should look quite ruddy.
2. Flesh tones are reddest on convexities, i.e., cheeks, chin, tip of nose, knuckles of hands, etc.
3. Spread a general wash of dilute tri-color blue over all flesh areas.
4. Mix two washes in the porcelain palette, one dilute orange, the other blue violet. Use these to balance flesh tones. Use orange to warm up areas that are too cold; use blue-violet to cool down areas that are too hot.

The print is now thoroughly dried and placed in a press.

Materials For Metalchrome Process

Primary Color Agents.
1. Ferricyamide Bleach (use without dilution).
2. Metallic base (sulphide toner—for use, dilute with twenty parts of water).
3. Gold chloride toner (do not dilute).

Secondary Color Agents.
1. Tri-color blue (Cobalt Blue).
2. Tri-color yellow (Lemon Yellow).
3. Tri-color red (Crimson Lake).
4. Tri-color blue and red.
5. Tri-color yellow with red.

Accessories:
1. Two pots.
2. One brush container.
3. Four brushes.
4. Three droppers.
5. Three Mongol crayons, Nos. 845, 846, and 867.
6. One package pumice.
7. Porcelain palette.
8. One dozen blotters.
9. Razor blades.

Formulae

1. **Ferricyanide Bleach**

Potas. Ferr	1 oz.
Potas. Bromide	1 oz.
Dist. Water to	20 oz.

2. **Stock Sodium Sulphide**

Pure Sodium sulphide	2 oz.
Water	5 oz.

3. **Gold Chloride Tone**

a. Dissolve 15 grs. gold chloride in 8½ oz. of water.

b. Hypo	310 grs.
Thiocarbamid	155 grs.
Water	8½ oz.

Pour solution a. into b. solution.
Keep in brown bottle.

Tri-color red, blue and yellow are listed as: Crimson Lake, Cobalt Blue, and Lemon Yellow, and are obtained from: The Wold Air Brush Co., Chicago, Ill.

Basic Rules in Color

1. There should not be more than one area of pure (or nearly pure) color.
2. This area should not occupy more than one-eighth of the entire picture space.
3. This area of dominant color should be near the point of greatest interest in the subject.
4. Colors in all other parts of the picture must be subdued or secondary.
5. All these secondary colors must contain at least a faint tincture of the color of the dominant area.
6. Each area of secondary color must contain a trace of the color of the immediate adjacent areas.
7. In the shadows or depressions of the secondary washes of color there should be stronger color of the same hue.

rection he decided that for his purposes the technique of working directly on the print with a blade was much the best. This he called abrasion, or abrasion-tone. He both used and taught this particular control means through the rest of his career.

For similar reasons he developed the Metalchrome process as a means of giving the maker complete control of the print from the standpoint of color.

There has been much talk in photographic circles over the years of the "secrecy" of the Metalchrome process. For this reason, it seemed the best way of presenting this material would be to print the accompanying "Original Metalchrome Text," word for word, as it was presented to Mortensen's Metalchrome students over his teaching career.

While this text might be sufficient when accompanied by demonstrations and instruction, I feel that a more detailed explanation of some of the important points may be helpful to the uninitiated. Accordingly they will be discussed under various headings in the notes that follow.

Printing Paper:

This refers to an old Gevaert 2N formula which has been changed radically. Almost any paper may be used however, as paper preference was governed by its adaptability to the "abrasion" or etching method of print control.

Develop:

Fully, in developer of your choice.

Wash:

After the print is washed, I generally prefer to remove only the surface water from the face of the print in order to keep the print from drying too soon.

Blue and Gray Eyes:

While the "wad of chewing gum" works just fine—rubber cement or frisket of any kind may be used with equal success, in case one does not chew gum. The aim is to "stop off" an area by protecting it from the action of the solution.

Gold Chloride Toner:

This particular use of Gold Chloride is apparently not too well known, and can cause a bit of trouble for the beginner. The following expanded explanation may be useful.

In practice the Gold Chloride Toner is used as a red toner—applied to the sepia-toned print in a selective manner to produce a range of red tones. The selective toning can be done by masking in the usual manner. In this instance, however, it has been found more satisfactory to use the "wet-print" method. This means soaking the print, blotting off the surface water from the face of the print, then applying the Gold Chloride to the desired areas with a brush. In this manner any degree of redness can easily be achieved. In the case of flesh-tones the usual procedure is to outline the flesh area with a brush wet with the solution—then flood the area inside the outline. This turns the flesh area red proportionally. The blotted print tends to keep the enclosed puddle of solution within the confines of the outline. If moderate care is taken there will be little or no leakage over the line. If the solution does get into any unwanted areas, it is a simple matter to immerse the print in water, blot, and begin again.

Secondary Color Agents:

Any of the at least six or eight brands of water-soluble analine dyes may be used. See your local graphic arts supply house. They may be "retouch" dyes or air-brush dyes—in any case the preference would be up to the user. The choice of the basic red-blue-yellow would also be that of the user, as would be the choice of intermediates such as red-blue, yellow-red, or any other. These selections should be made by each maker to best reflect the color-taste and discrimination of that maker. Transparent air brush colors are available by mail order from World Air Brush Mfg. Co., 2173 N. California Ave., Chicago, Ill. 60647, and a free catalog can be obtained from the manufacturer.

The dyes are best applied with brushes, the sizes of which vary with the individual, (I prefer round pointed sables from no. 5 to no. 15). The print is prepared for the dye application by soaking and blotting as in the gold tone application.

The distinctive flesh-tones are achieved by modifying the warm red of the gold tone with the dyes. For most, this part of the technique is the most difficult to acquire. The key to successful application is that it *must* be applied in the exact density of the underlying image to neutralize the warm tone of the red with the cool blue or green of the dyes. This key fact has been lost to many who have tried the process, and if lost can only result in an undesirable grubby or "tinted" appearance.

On Abrasion

The abrasion method of print control and finishing is described at length in Mortensen's book, *Print Finishing*. Abrasion in this instance means, simply, breaking a single-edge razor blade diagonally to form a tapered cutting point which is used as an etching tool on the face of a dry print. This is done to control contrast in small areas, to remove small areas of unwanted detail, or to improve or emphasize any part of the picture by lightening tones.

As a print control method it compares in results with the paper negative technique, or local print reduction with Etchadyne. It might be noted here that of the three men who are currently exhibiting Metalchrome prints in the salons, Richard Maybery of Laguna Niguel, Calif., uses abrasion but sparingly. Noel Engel of Houston, Tex., prefers to use Etchadyne or paper negative, and I use all three but mostly abrasion or paper negative. Whether or not any of the black-and-white print control methods are used has little effect on the application of color.

The "tone" mentioned in the book consisted of powdered drawing crayons blended to match the black-and-white emulsion. This

powder was smudged into the emulsion and controled by blending with powdered pumice. Subsequently the crayon powders were replaced with regular drawing pencils, and the pumice procedure was dropped in 1948 or thereabouts. The crayons mentioned in this text were Mongol pencils—red, blue and black—and were used for the final spotting of the completed Metalchrome print. The Mongols have since been replaced by "Winner" pencils. This spotting and finishing operation may also be done with the dyes on the completed print.

All the Mortensen books have been out of print for some time now. The list of titles follows:

The Model
Pictorial Lighting
Outdoor Portraiture
The Command to Look
Monsters and Madonnas
New Projection Control
Flash in Modern Photography
Print Finishing
Posing the Model

This month's Cover

Pouring Milk, which appears on the cover of this month's Journal, is an outstanding example of Mortensen's work with Metalchrome. Each year the Royal Photographic Society's Council elects a recipient of the Hood Medal, presented for "A meritorious performance in some field of photography." In 1949 the Royal awarded this medal to Mortensen in recognition of his efforts in developing the process, and to *Pouring Milk* as an example of the Metalchrome technique.

The Metalchrome process of applying color to a black-and-white print—while it certainly gives the maker complete control of the color—does not tell the maker how to use the color under his control. This brings up a rather pertinent question; why are we using color on the print in the first place? Having color just for color's sake is not enough. To make a successful color rendition it is necessary to know something of the use of color. In a word, color for color's sake is rather unimportant. Color for the sake of imparting the emotion and mood of the picture story has a potential beyond conjecture, in photography as in any other medium.

In any case, this enchanting means of making a picture can't help but give the user an intense feeling of satisfaction with every completed print. It also must help one to grow pictorially with each success—and with each failure. One develops a real appreciation of the works of those who have mastered the use of color in any medium—photography, oils, water color, or whatever. A picture is a picture. However you make yours—enjoy it! ■

about the author

Grey Silva makes his home at San Diego, Calif. He first became interested in photography in 1957 and went to William Mortensen for instruction. He drove to Laguna Beach at least one day per week from then on, staying for a week or two at a stretch several times each year, until Mr. Mortensen's death in 1965. "In the course of our association we shared many enthusiasms," he reports, ". . . photography, painting and the arts in general, and enjoyed a close friendship based on these enthusiasms. At the end of the nine years I was still learning much from this great maker of pictures—and was beginning to understand that which he had been teaching through the years. I enjoy life immensely. A large part of this is the enjoyment of making prints and the appreciation of the works of others, in any media. This I attribute directly to the motivation, instruction and inspiration he gave me."

Mr. Silva will present a program on the Metalchrome process at the PSA International Convention in Los Angeles next August, showing results in color and demonstrating some of the more difficult parts of the technique. His portrait above was made by Mr. Mortensen.—Ed.

SIMPLIFIED C-22 FORMULAS

Read entire article before attempting to mix solutions.

TIME-TEMPERATURE CHART - all temperatures at 75°f

Developer	14 minutes
Stop Bath	4 minutes
Hardener	4 minutes
Wash	4 minutes
Bleach	6 minutes
Wash	4 minutes
Fixer	8 minutes
Wash	8 minutes
Final Rinse	1 minute
Dry - not over 110°f	

C-22 DEVELOPER		Dignan's Catalog No.
Water	500.0 cc	
Benzyl Alcohol	5.0 cc	(B200)
Diethylene Glycol	15.0 cc	(D380)

Stir this solution until all oily droplets of Benzyl Alcohol are dissolved. These droplets will appear on the top of the solution and are sometimes difficult to see. This operation may take as long as 5 minutes of continuous stirring. Heating the water to 125°f will help dissolve the Benzyl Alcohol more rapidly.

Let solution cool to 90°f, then add:

Potassium Bromide	1.7 grams	(P530)
(1) Potassium Iodide (stock sol.)*	5.0 cc	(P600)
(2) Sodium Metaborate	88.0 grams	(S700)
(3) Sodium Sulfite, anhy.	1.85 grams	(S790)
CD-3	5.0 grams	(DD-3)
(4) Calgon, photograde	2.5 grams	(C150)
Water to	1.0 liter (1000. cc)	

Dissolve chemicals in the order given. Stir the mixture until each chemical is completely dissolved before adding the next chemical.

NOTE: When mixed, the solution will appear somewhat cloudy; this affect is normal and can be disregarded.

(1) Potassium Iodide: The amount of Potassium Iodide needed in this formula is extremely small, 1/2 milligram. This small amount can be easily prepared in the following manner: add 1 gram of Potassium Iodide to one liter (1000 cc) of distilled water. Measure off 100 cc's of this solution (this amount will contain 1/10 of a gram of Potassium Iodide), discard remaining 900 cc's.

-more-

(1) - continued

To the 100 cc's that you saved add 900 cc's of distilled water. 10 cc's of this stock solution is equal to 1 milligram (1/1000 of a gram). This formula calls for 1/2 of a milligram or 5.0 cc's of the stock solution.

This stock solution, when kept in a closed bottle, will keep for 1 to 2 years.

(2) Because a relatively large amount of this chemical is involved, it should be poured in slowly with constant stirring. If poured in all at one time it may form a difficult to dissolve cake at the bottom of the container.

(3) The amount of Sodium Sulfite is critical and should be measured as accurately as possible. Anhy. is the abbreviation for anhydrous which means that the sulfite used should contain no water of crystallization. Some brands of sulfite are labeled desiccated which means with as much water removed as possible. Anhy. and desiccated are synanymous photographically.

(4) Calgon is a sequestering agent used to chemically inactivate undesirable chemicals found in tap water such as Calcium Carbonate.

Agitate for the first 15 seconds. With the Nikor, turn tank once every 30 seconds thereafter. With a spin-type tank, turn left and then right once every 30 seconds.

REPLENISHMENT:

To obtain optimum results with this developer, we are no longer recommending replenishment. It should be used only once and then discarded. This may seem like a waste of good chemicals but for consistently high quality negatives that are easy to print you will find this is the best method and in the long run the least expensive.

The use of Sodium Metaborate replaces the Sodium Hydroxide and Borax that is recommended in the C-22 formulas published in the Newsletter (see L-250). A more expensive substitute for the Sodium Metaborate is Kodak Balanced Alkali or Kodalk, which are Kodak trade names for Sodium Metaborate. Kodak's Balanced Alkali was recommended in the older Official formulas for C-22, (see Newsletter A-23).

In the interest of further shortening, and uncomplicating, the C-22 process, Dignan Photographic has compounded a series of concentrates to be used after the C-22 developer. For example, we propose a concentrated stop-bath which would be mixed as follows:

		Dignan's Catalog No.
Water	500.0 cc	
Glacial Acetic Acid	75.0 cc	(not carried)
Water to	1.0 liter	

To use, merely dilute one part of the concentrate with 3 parts of water. Use for 4 minutes at 75°f, and discard.

You can also use the following simple stop-bath:

Water	800.0 cc	
Sodium Diacetate	20.0 grams	(S540)
Water to	1.0 liter	

pH at 75°f: 5.0

NOTE: Sodium Diacetate is much less toxic to store and use than Glacial Acetic Acid. When placed in solution it forms approximately 50% Acetic Acid and 50% Sodium Acetate which acts as a buffer to maintain the pH.

The next concentrate would be the hardener. This is made up as follows:

Water	500.0 cc	
Sodium Carbonate (mono.)	85.0 cc*	
Formalin, 40% solution	85.0 cc	(not carried)
Water to	1.0 liter	

*By volume! This is done by pouring the dry chemical into a graduate up to the 85.0 cc mark. The amount is not critical and this makes for faster mixing.

To use, dilute <u>one part</u> of concentrate with three parts of water, use for 4 minutes at 75°f and discard.

<u>Formalin Note:</u> Formalin is a water solution of the gas Formaldehyde. It keeps best as a 37% by weight solution. When manufactured a small amount of methylalcohol is added to help prevent polymerization which forms the solid para-formaldehyde. This can be detected in old bottles as a white sediment. Formalin is available in most drug and photo stores. The amount used in the above formula is not critical. Formaldehyde is used as the hardening agent because of its ability to harden any protein. Besides gelatin it will also harden your skin. Continued skin contact will cause hardening and cracking and the possibility of dermatitis.

Unprocessed film or paper should not be subjected to formaldehyde vapors. It can not only harden the emulsion and thereby interfer with processing, but it may also introduce color fog. Formaldehyde hardens more rapidly in an alkali solution. The Sodium Carbonate's function is to increase the pH. The amount is not critical.

We also combined the bleach with the fixer to make a form of Farmer's Reducer. This, too, is used as a one-shot and bleaching and fixing is accomplished at the same time.

The Fixer consists of using one ounce of 60% Ammonium Thiosulfate* or Kodak Rapid Fix (without Hardener), in 6 ounces of water, then add one ounce of a stock solution of Potassium Ferricyanide which is made as follows:

Potassium Ferricyanide	160.0 cc **	(P580)
Water to make	500.0 cc	

**By volume! As with the hardener, pour the dry chemical into a graduate up to the 160.0 cc mark. This makes for faster fixing.

This makes a saturated solution - after mixing crystals will separate out. These should be filtered off.

The above stock solution, when diluted, is used for 6 minutes at 75°f., and then discarded. This is followed by a six minute wash in running water at 75°f.

One further note: The Ferricyanide solution is only made up to 500 cc because a ferricyanide solution does not have a good shelf life. The mixed solution will keep for a number of weeks if put into a dark bottle and protected from the light.

CAUTION: When ferricyanide is mixed with Kodak Rapid Fix (which is Ammonium Thiosulfate) its life is very short. Do not attempt to reuse it.

When used as directed, in our short process, the total time will be 35½ minutes for processing, as compared to the 53 minutes for the Kodak Process. 16 rolls of film can be processed from these concentrates.

Time-table at 75°f (short process)

Developer	14 minutes
Stop bath	4 minutes
Hardener	4 minutes
Wash	1 minute
Bleach-fix	6 minutes
Wash	6 minutes
Rinse	30 seconds

Except for the developer, these simplified formulas can all be used to process the "Internegative films" as discussed on page of this Newsletter.

*Due to excessive breakage the last few months, we find it necessary to discontinue this chemical completely. There are two alternatives, the first being that in any formula that stipulates Ammonium Thiosulfate you can substitute 200 grams of Sodium Thiosulfate to one liter of water and double the processing time. Secondly, Ammonium Thiosulfate is available as Kodak Rapid Fix and also under a number of other proprietary names. All can be purchased as a liquid and should be used without the hardener, the hardener being always available as a separate package.

KODAK EKTACOLOR INTERNEGATIVE FILM 6110
and KODAK INTERNEGATIVE COLOR FILM 6008

One of the problems confronting the photographer before using a new film is securing enough basic information about its special characteristics, such as when should you use it, why should you use it and how should you use it, before purchasing the film. With this in mind we offer the following excerpts from Kodak data sheets supplied with the film and chemicals. The information is not complete so before using either of these emulsions the instruction sheets supplied with the film should be studied.

"The emulsions used in internegative color films are softer than those used in black-and-white films; therefore, take greater precautions against abrasions and scratches.

"Kodak Ektacolor Internegative Film 6110 can be processed in sheet-film hangers, such as Kodak Film and Plate Developing Hangers No. 4A or Kodak Multiple Film Hangers. During processing, keep hangers parallel and separated by approximately equal spacing of at least 1/2 inch. Use of the Kodak Developing Hanger Rack No. 40 with Kodak Hanger Separators is required.

"Kodak Internegative Color Film 6008 in lengths up to 100 feet can be processed in stainless-steel spiral reels, or in continuous processors of the type used in motion-picture laboratories. Shorter strips of film, equivalent in length to 20- or 36-exposure rolls for 35mm cameras, can be processed in a variety of rack-and-tank (deep tank), reel-and-rack (3½-gallon tank), or single- or multiple-reel tank equipment.

"Kodak Internegative Color Film 6008 is supplied in rolls, 35mm by 80 feet perforated, 46mm by 100 feet not perforated, and 2.423 inches by 100 feet not perforated. It is designed for exposure by tungsten quality illumination having a color temperature of about 3200 K. Uses are: (1) making color internegatives from color transparencies and (2) making copy negatives from color prints or artwork."

Storage:

"High temperature or high humidity may produce undesirable changes in Kodak Ektacolor Films. Keep UNEXPOSED film in its original sealed package in a freezing unit at 0 to -10 F (-18 to -23 C). If storage space in a freezer is not available, store the film in a refrigerator where the maximum temperature is no higher than 35 F (2 C). To avoid changes in the latent image, process EXPOSED film as soon as possible after exposure."

Exposure Time Range for 6008:

"Do not expose Kodak Internegative Color Film 6008 for times shorter than 1/10 second or longer than 16 seconds, because the resulting negatives may contain color-reproduction errors that cannot be corrected satisfactorily in the printing operation."

Exposure Time Range for 6110:

"These instructions assume an exposure time of 10 seconds, although times from 1 to 16 seconds can be used without changing the characteristics of the internegatives greatly. The effect of increasing the exposure time is to shorten the available latitude of the internegative film."

Replenishment:

"Only a replenished system is recommended for processing internegative films. It is not practical to control an unreplenished process within the necessary limits by adjustments of the development time."

"Add replenishers after each processing run or as prescribed in a metered system. Note that the rates given below for the Developer and the Fixer are different from those for Process C-22. Divide any rate given in ml by 29.57 to determine the corresponding value in fluidounces (U.S. Liquid System). In manual systems, remove enough solution from the processing tank so that the amount of replenisher added will bring the total volume back to the original level.

For Kodak Ektacolor Internegative Film 6110:

	ml per 4 x 5	ml per 5 x 7	ml per 8 x 10
Internegative Developer Replenisher	84	146	334
C-22 Stop Bath Replenisher	45	79	180
C-22 Hardener Replenisher	10	19	44
C-22 Bleach Replenisher	10	19	44
C-22 Fixer Replenisher	18	32	72

For Kodak Internegative Color Film 6008:

	ml per lineal ft		
	35mm perf.	46mm not perf.	2.423-in. not perf.
Internegative Developer Replenisher	60	90	120
C-22 Stop Bath Replenisher	33	50	66
C-22 Hardener Replenisher	8	12	16
C-22 Bleach Replenisher	8	12	16
C-22 Fixer Replenisher	13	19.5	26

Ed: This replenishment procedure is for the pre-packaged chemical kit. We have not tested this replenishment procedure with the Official Kodak formulas given later in this article.

Agitation:

"Proper agitation is extremely important to insure uniform development.

"Sheet Films. Kodak Ektacolor Internegative Film 6110 should be processed in conventional hangers. Gaseous-burst agitation in the Developer is required; except for the first 15 seconds, manual agitation in the Developer is not recommended. Note that the procedure described for sheet films includes end-for-end reversal of the hanger rack during development. CAUTION: Do not allow the emulsion side of an 8 x 10-inch sheet of film to face a multiple film hanger.

"Roll Film. Gaseous-burst agitation is not recommended for processing Kodak Internegative Color Film 6008 on spiral reels; manual agitation of the lift-and-drain type must be used. The agitations should be as frequent and vigorous as possible, without causing streaks or other nonuniformities of development.

"Internegative roll film suspended vertically in a deep tank, as in the Kodak Rack and Tank Color Film Processor, Model 10C, can be processed with gaseous-burst agitation. However, careful adjustment is necessary to obtain maximum agitation without causing streaks. Best uniformity with long lengths of roll film is obtained in continuous motion-picture processing machines using submerged jet turbulation.

Gaseous-Burst Agitation:

"The following detailed procedure applies only to Kodak Ektacolor Internegative Film 6110 in sheet-film hangers. After the initial hand agitation, nitrogen-burst agitation in the Developer is required.

"Developer, Initial - Lower the rack into the solution and tap it sharply against the upper edges of the tank to dislodge any air bubbles that may be clinging to the emulsion; then carry out the following cycle twice during the first 15 seconds: In rapid succession, (1) lift the rack clear of the solution, (2) tilt it 60° or more in one direction, (3) reimmerse it, (4) lift the rack clear again, (5) tilt it 60° or more in the opposite direction, and (6) reimmerse it. Note that two tilts are required for each cycle, with no pause for draining. The entire cycle of six motions should be carried out rapidly but smoothly in about 7 seconds.

"Developer, Subsequent - Thereafter, the agitation consists of a 2-second nitrogen burst every 15 seconds, at a pressure sufficient to raise the solution level about 5/8 inch with each furst of gas. Halfway through the development time, remove the rack completely from the developer, reverse its direction end for end, and reimmerse it.

"Other Solutions and Washes, Initial - Agitate the films continuously for the first 15 seconds by lifting the rack straight up out of the solution and reimmersing it four times. Only the initial agitation need be given during wash steps."

"Other Solutions, Subsequent - Thereafter, either gaseous-burst or manual agitation can be employed; gaseous-burst agitation is preferable. The gaseous-burst agitation consists of a 2-second burst every 15 seconds. The optional manual agitation consists of lifting the rack completely out of the solution once each minute and draining it for 5 seconds from one corner. Alternate the direction of tilting the rack."

Timing: Include drain time (10 seconds) in time for each processing step.

Solution or Procedure	Remarks	Temp F	6110 & 6008 Time In Min.
1. Developer	Agitate as prescribed	$75 \pm \frac{1}{2}$	5 - (6110) 6 - (6008)

NOTE: Except for the timing of gaseous-burst agitation, the following steps are identical to those of Process C-22.

2. Stop Bath		73-77	4
3. Hardener		73-77	4

Remaining steps can be done in normal room light.

4. Wash	Running water	73-77	4
5. Bleach	See warning on label	73-77	6
6. Wash	Running water	73-77	4
7. Fixer		73-77	8
8. Wash	Running water	73-77	8
9. Final Rinse	Kodak Photo-Flo Solution	73-77	1
10. Dry	Remove film from hangers	Not over 110	

OFFICIAL KODAK FORMULAS FOR PROCESSING EKTACOLOR INTERNEGATIVE FILM 6110 (sheet) AND KODAK INTERNEGATIVE COLOR FILM 6008 (35mm)

PROCESS N-31

			Dignan's Catalog No.
Water	800.0	cc	
Benzyl Alcohol	2.4	cc	(B200)
Foamex (wetting agent)	0.1	cc	(not carried)
Quadrafos*	2.0	grams	(not carried)
Sodium Sulfite (anhy.)	2.0	grams	(S790)
Sodium Bromide	0.07	grams	(S425)
Sodium Hydroxide	12.9	grams	(not carried)
Borax ($10H_20$)	58.8	grams	(B301)
Water to make	1.0	liter	

NOTE SPECIAL INSTRUCTIONS: Add and dissolve completely each chemical in the order given, then bring solution to its total volume of one liter. Mix for 20 minutes, then allow solution to stand for fifteen minutes.

Then add:

CD-3 (color developing agent)	5.20	grams	(DD-3)

pH at 75°f: 10.66 ± 0.07

Spec. Gravity at 75°f: 1.050 ± 0.002

PROCESS N-31 REPLENISHER

Water	800.0	cc	
Benzyl Alcohol	2.44	cc	(B200)
Foamex (wetting agent)	.01	cc	(not carried)
Quadrafos*	2.0	grams	(not carried)
Sodium Sulfite	2.13	grams	(S790)
Sodium Bromide	None		
Sodium Hydroxide	12.9	grams	(not carried)
Borax ($10H_20$)	58.8	grams	(B301)
Water to make	1.0	liter	

NOTE SPECIAL INSTRUCTIONS: Add and dissolve completely each chemical in the order given, bring solution to its total volume of one liter. Mix for 20 minutes, then allow solution to stand for fifteen minutes.

Then add:

CD-3 (color developing agent)	5.50	grams	(DD-3)

pH at 75°f: 10.68 ± 0.07

Spec. Gravity at 75°f: 1.050 ± 0.002

*Quadrafos is Sodium Hexametaphosphate. You can substitute 2.0 grams of Calgon (C150) for this.

Dignan Note: The balance of these formulas are Kodak Official C-22 which first appeared in our Newsletter, page A-24.

These formulas will produce solutions that are of greater volume than 1. liter. As with Kodak's kits, you start with the total amount of water and then add the chemicals.

KODAK STOP BATH SB-10		Dignan's Catalog No.
Water (about 90°f)	1.0 liter	
Glacial Acetic Acid	18.0 cc	(not carried)
Sodium Acetate (desc.)	2.5 grams	(S370)

KODAK STOP BATH REPLENISHER SB-10R		
Water (about 90°f)	1.0 liter	
Glacial Acetic Acid	27.3 cc	(not carried)

(add the acid to the water)

KODAK HARDENER SH-6		
Water (about 90°f)	1.0 liter	
Formaldehyde (about 37%)	21.0 cc	(not carried)
Calgon	2.0 grams	(C150)
Sodium Carbonate (mono.)	23.0 grams	(S501)

CAUTION: Unprocessed films or papers should not be subjected to Formaldehyde vapor, which hardens the emulsion and thereby interfers with processing.

KODAK BLEACH SR-6		
Water (about 90°f)	1.0 liter	
Sodium Nitrate	30.0 grams	(not carried)
Potassium Ferricyanide	30.0 grams	(P580)
Sodium Ferrocyanide	15.0 grams	(S566)
Potassium Bromide	15.0 grams	(P530)
Borax ($10H_20$)	9.6 grams	(B301)
Boric Acid	15.0 grams	(B350)

WARNING: This bath corrodes metal. Store in red brass, polyethylene, earthenware, porcelain, rubber, glass, or enamelware receptacles, the surface of wich should be free from cracks or chips.

NOTE: Sodium Nitrate is used as an anti-corrosion chemical. It can be left out of the formula without effecting the bleaching action.

KODAK FIXER F-30		Dignan's Catalog No.
Water (about 80°f)	1.0 liter	
Sodium Thiosulfate ($5H_2O$)*	320.0 grams	(not carried)
Sodium Bisulfite	1.47 grams	(S400)
Sodium Sulfite (des.)	5.9 grams	(S790)

*The Sodium Thiosulfate crystals contain $5H_2O$. We only carry the anhy., (S810). In the above fixer, you would use 204. grams of anhy. instead of 320. grams crystal.

The official formulas do not mention a Photo-Flo rinse, but their kits do, and we would also suggest that you use one.

REPLENISHMENT RATES:

Stop Bath:	325 cc per sq. foot of film.
Hardener, bleach & fixer:	81 cc per sq. foot of film.

NOTE: Formaldehyde can be purchased at most drug stores as Formalin. Acetic Acid is available in most camera stores.